METHOD FOR SELECTING OBJECTS ON A COMPUTER DISPLAY

This is a continuation, of application Ser. No. 07/888,741 filed May 26, 1992 now abandoned.

BACKGROUND OF THE INVENTION

The present invention relates generally to the selection of images on a computer screen, and more particularly methods for selecting objects on the screen of a pen-based computer system.

A pen-based computer system is typically a small, hand-held computer where the primary method for inputting data includes a "pen" or stylus. A pen-based computer system is commonly housed in a generally rectangular enclosure, and has a dual-function display assembly providing a viewing screen along one of the planar sides of the enclosure. The dual-function display assembly serves as both an input device and an output device. When operating as an input device, the display assembly senses the position of the tip of a stylus on the viewing screen and provides this positional information to the computer's central processing unit (CPU). Some display assemblies can also sense the pressure of the stylus on the screen to provide further information to the CPU. When operating as an output device, the display assembly presents computer-generated images on the screen.

The dual-function display assemblies of pen-based computer systems permit users to operate the computer as a computerized notepad. For example, graphical images can be input into the pen-based computer by merely moving the stylus on the surface of the screen. As the CPU senses the position and movement of the stylus, it generates a corresponding image on the screen to create the illusion that the stylus is drawing the image directly upon the screen, i.e. that the stylus is "inking" an image on the screen. With suitable recognition software, text and numeric information can also be entered into the pen-based computer system in a similar fashion.

With both pen-based computers and ordinary computers, it is often desirable to select part or all of an "object" displayed on a screen. These objects can take various forms such as text objects, graphical objects, numerical objects, tabular objects, etc. For example, when word processing, it is often desirable to be able to select a word, a sentence, or a paragraph for deletion or for a cut-and-paste operation. With a graphical object, part or all of a graphic can be selected for movement, resizing, or reorientation.

This selection process is often referred to as a "highlighting" process because the selected portion of the object is emphasized in some dramatic fashion such as reverse video, a bolder line, or a distinctive background. With both conventional and pen-based computers, the selection step is usually a predecessor to some form of action to be undertaken with the selected material. The selection process of the prior art tends to be quite literal. For example, if a word is to be selected a pointer in a selection mode is carefully moved over the word or words to cause selection. Alternatively, in mouse and other pointer-type systems, a word can be clicked on twice to indicate that the word should be highlighted, three times to indicate that the word sentence should be highlighted, four times to indicate that the paragraph should be highlighted, etc.

While this literal selection process works well in general purpose computer systems using traditional pointing devices

such as mice, track balls, etc., it is not very well adapted to the pen-based computer system environment. Since the primary input device of a pen-based system is a stylus, it is difficult or undesirable to be required to accurately point to the portions of an object to be selected.

SUMMARY OF THE INVENTION

It is therefore desirable to provide a selection or "highlighting" process which is particularly well adapted to the pen-based computer environment. The selection process should be able to accurately select a part or all of an object based upon a less-than-precise movement of a stylus across the screen of a pen-based computer.

Briefly, the method of the present invention includes the steps of moving a stylus on a path across at least a portion of an object depicted on the screen of a computer display, creating a line image on the screen along the path, selecting at least a portion of the object as indicated by the path, and creating a visual depiction of the selection on the screen. The line image formed on the screen is made from a string of short line segments. The visual depiction of the selection can occur either concurrently with or after the creation of the line image on the screen. Preferably, the line image on the screen is removed after the visual depiction of the selection is made.

The present invention further includes a method for detecting a user's intention to enter the selection mode. In the context of a pen-based computer system, this intention is manifested in the form of a "gesture" made by the stylus on the screen. A first gesture of the present invention comprises placing the point of a stylus on the screen for longer than a predetermined period of time. This will cause the "ink" produced by the stylus to change from normal ink to a wider, "highlighter" ink. A second gesture in accordance with the present invention comprises a "tap-and-a-half" where the stylus is tapped and then returned to the screen within a short period of time. A third gesture in accordance with the present invention comprises drawing a small circle within a predetermined period of time.

This invention also includes a number of selection modes. For example, a "precise" selection mode will select well defined portions of an object, while an "imprecise" selection mode will select larger portions or an entire object. Selection algorithms for specific object types, such as text objects and graphical objects, and for general object types are also disclosed.

An advantage of the present invention is that objects and portions of objects displayed on the screen of a pen-based computer system can be easily and accurately selected. The three disclosed gestures permit the user of a pen-based computer system to quickly enter into the selection mode, and the various selection modes allow both precise and imprecise selections to be made.

These and other advantages of the present invention will become apparent to those skilled in the art upon a reading of the following specification of the invention and a study of the several figures of the drawing.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a pen-based computer system in accordance with the present invention;

FIG. **2** is a pictorial representation of the screen of a computer display assembly of the present invention where a text, graphical, and a general objects has been entered;